

Appendix D. Health Effects Summary Table

Species	System	Exposure Duration	LOAEL mg/kg/day	Effect
Human	hemato	7 wk at 7 days/wk	0.01	decrease ALAD activity; increased RBC porphyrin
Human	hemato	21 days at 7 days/wk	0.02	increased protoporphyrin IX in RBC (F)
Rat	hepatic	20-30 d	0.05	decreased RNA, glycogen; pyknosis of Kupffer cells; increased liver weight
Rat	hemato	6-12 mo	0.005	impaired heme synthesis
Rat	hepatic	6-12 mo	0.005	decreased glycogen, RNA, sulfhydryl groups, alterations in activities of oxidizing enzymes
Rat	cardio	159 d	0.3	increased systolic blood pressure
Monkey	neuro	200 d; 5 d/wk	0.05	Impaired nonspatial discrimination at 3 yrs of age
Rat	neuro	6-12 mo	0.005	disruption of conditioned responses and motor activity
Rat	repro	30 d	0.013	increased prostate weight (M)
Rat	repro	30 d	0.014	irregular estrus cycles (F)
Rat	repro	6-12 mo	0.05	decreased activity of AIDH, SDH, NAD, and DADPH-diaphorase in spermatogenic epithelium and swelling of lolicular epithelial cells in males
Rat	repro	23-30 d	0.005	dystrophy of Leydig cells
Rat	cardio	<18 mo; 7 d/wk	0.014	increase in systolic blood pressure
Monkey	neuro	1 yr; 7 d/wk	0.19	deficit in fixed interval schedule

ALAD = aminolevulinic acid dehydratase; cardio = cardiovascular; d = days; F = female; hemato = hematological; LOAEL = lowest-observable-adverse-effect level; M = male; mg/kg/day = milligrams per kilogram per day; mo = month; neuro = neurological; RBC = red blood cell; repro = reproductive; RNA = ribonucleic acid; wk = week; yr = year

Appendix E. Comprehensive Follow-up Services Recommended According to Diagnostic*
Blood Lead Level (BLL); (CDC 1997, table 4.3)

BLL ($\mu\text{g/dl}$)	Action
<10	Reassess or rescreen in 1 year. No additional action necessary unless exposure source changes.
10-14	Provide Family lead education. Provide follow-up testing. Refer for social services, if necessary.
15-19	Provide Family lead education. Provide follow-up testing. Refer for social services, if necessary. If BLLs persist (i.e., 2 venous BLLs in this range at least 3 months apart) or worsen, proceed according to actions for BLLs 20-44.
20-44	Provide coordination of care (case management). Provide clinical management (described in text). Provide environmental investigation. Provide lead-hazard control.
45-69	Within 48 hours, begin coordination of care (case management), clinical management (described in text), environmental investigation, and lead hazard control.
≥ 70	Hospitalize child and begin medical treatment immediately. Begin coordination of care (case management), clinical management (described in text), environmental investigation, and lead hazard control immediately.

*A diagnostic BLL is the first venous BLL obtained within 6 months of an elevated screening for BLL.

ATSDR Plain Language Glossary of Environmental Health Terms

Absorption:	How a chemical enters a person's blood after the chemical has been swallowed, has come into contact with the skin, or has been breathed in.
Acute Exposure:	Contact with a chemical that happens once or only for a limited period of time. ATSDR defines acute exposures as those that might last up to 14 days.
Adverse Health Effect:	A change in body function or the structures of cells that can lead to disease or health problems.
ATSDR:	The Agency for Toxic Substances and Disease Registry. ATSDR is a federal health agency in Atlanta, Georgia that deals with hazardous substance and waste site issues. ATSDR gives people information about harmful chemicals in their environment and tells people how to protect themselves from coming into contact with chemicals.
Background Level:	An average or expected amount of a chemical in a specific environment. Or, amounts of chemicals that occur naturally in a specific environment.
Biota:	Used in public health, things that humans would eat – including animals, fish and plants.
Cancer:	A group of diseases which occur when cells in the body become abnormal and grow, or multiply, out of control
Carcinogen:	Any substance shown to cause tumors or cancer in experimental studies.
Chronic Exposure:	A contact with a substance or chemical that happens over a long period of time. ATSDR considers exposures of more than one year to be <i>chronic</i> .
Completed Exposure Pathway:	See Exposure Pathway.
Comprehensive Environmental Response, Compensation, and Liability	

Act (CERCLA):	CERCLA was put into place in 1980. It is also known as Superfund . This act concerns releases of hazardous substances into the environment, and the cleanup of these substances and hazardous waste sites. ATSDR was created by this act and is responsible for looking into the health issues related to hazardous waste sites.
Concern:	A belief or worry that chemicals in the environment might cause harm to people.
Concentration:	How much or the amount of a substance present in a certain amount of soil, water, air, or food.
Contaminant:	See Environmental Contaminant .
Delayed Health Effect:	A disease or injury that happens as a result of exposures that may have occurred far in the past.
Dermal Contact:	A chemical getting onto your skin. (see Route of Exposure).
Dose:	The amount of a substance to which a person may be exposed, usually on a daily basis. Dose is often explained as "amount of substance(s) per body weight per day".
Dose / Response:	The relationship between the amount of exposure (dose) and the change in body function or health that result.
Duration:	The amount of time (days, months, years) that a person is exposed to a chemical.
Environmental Contaminant:	A substance (chemical) that gets into a system (person, animal, or the environment) in amounts higher than that found in Background Level , or what would be expected.
Environmental Media:	Usually refers to the air, water, and soil in which chemicals of interest are found. Sometimes refers to the plants and animals that are eaten by humans. Environmental Media is the second part of an Exposure Pathway .

**U.S. Environmental
Protection**

- Agency (EPA):** The federal agency that develops and enforces environmental laws to protect the environment and the public's health.
- Epidemiology:** The study of the different factors that determine how often, in how many people, and in which people will disease occur.
- Exposure:** Coming into contact with a chemical substance. (For the three ways people can come in contact with substances, see **Route of Exposure**.)
- Exposure Assessment:** The process of finding the ways people come in contact with chemicals, how often and how long they come in contact with chemicals, and the amounts of chemicals with which they come in contact.
- Exposure Pathway:** A description of the way that a chemical moves from its source (where it began) to where and how people can come into contact with (or get exposed to) the chemical.
- ATSDR defines an exposure pathway as having 5 parts:
4. Source of Contamination,
 5. Environmental Media and Transport Mechanism,
 6. Point of Exposure,
 7. Route of Exposure, and
 8. Receptor Population.
- When all 5 parts of an exposure pathway are present, it is called a **Completed Exposure Pathway**. Each of these 5 terms is defined in this Glossary.
- Frequency:** How often a person is exposed to a chemical over time; for example, every day, once a week, twice a month.
- Hazardous Waste:** Substances that have been released or thrown away into the environment and, under certain conditions, could be harmful to people who come into contact with them.
- Health Effect:** ATSDR deals only with **Adverse Health Effects** (see definition in this Glossary).

Indeterminate Public

- Health Hazard:** The category is used in Public Health Assessment documents for sites where important information is lacking (missing or has not yet been gathered) about site-related chemical exposures.
- Ingestion:** Swallowing something, as in eating or drinking. It is a way a chemical can enter your body (See **Route of Exposure**).
- Inhalation:** Breathing. It is a way a chemical can enter your body (See **Route of Exposure**).
- LOAEL:** **Lowest Observed Adverse Effect Level.** The lowest dose of a chemical in a study, or group of studies, that has caused harmful health effects in people or animals.
- MRL:** **Minimal Risk Level.** An estimate of daily human exposure -- by a specified route and length of time -- to a dose of chemical that is likely to be without a measurable risk of adverse, noncancerous effects. An MRL should not be used as a predictor of adverse health effects.
- NPL:** **The National Priorities List.** (Which is part of **Superfund**.) A list kept by the U.S. Environmental Protection Agency (EPA) of the most serious, uncontrolled or abandoned hazardous waste sites in the country. An NPL site needs to be cleaned up or is being looked at to see if people can be exposed to chemicals from the site.
- NOAEL:** **No Observed Adverse Effect Level.** The highest dose of a chemical in a study, or group of studies, that did not cause harmful health effects in people or animals.

No Apparent Public

- Health Hazard:** The category is used in ATSDR's Public Health Assessment documents for sites where exposure to site-related chemicals may have occurred in the past or is still occurring but the exposures are not at levels expected to cause adverse health effects.

No Public

- Health Hazard:** The category is used in ATSDR's Public Health Assessment documents for sites where there is evidence of an absence of exposure to site-related chemicals.

PHA:

Public Health Assessment. A report or document that looks at chemicals at a hazardous waste site and tells if people could be harmed from coming into contact with those chemicals. The PHA also tells if possible further public health actions are needed.

Point of Exposure:

The place where someone can come into contact with a contaminated environmental medium (air, water, food or soil). For examples: the area of a playground that has contaminated dirt, a contaminated spring used for drinking water, the location where fruits or vegetables are grown in contaminated soil, or the backyard area where someone might breathe contaminated air.

Population:

A group of people living in a certain area; or the number of people in a certain area.

**Public Health
Assessment(s):**

See PHA.

**Public Health
Hazard:**

The category is used in PHAs for sites that have certain physical features or evidence of chronic, site-related chemical exposure that could result in adverse health effects.

**Public Health
Hazard Criteria:**

PHA categories given to a site which tell whether people could be harmed by conditions present at the site. Each are defined in the Glossary. The categories are:

- Urgent Public Health Hazard
- Public Health Hazard
- Indeterminate Public Health Hazard
- No Apparent Public Health Hazard
- No Public Health Hazard

**Receptor
Population:**

People who live or work in the path of one or more chemicals, and who could come into contact with them (See **Exposure Pathway**).

**Reference Dose
(RfD):**

An estimate, with safety factors (see **safety factor**) built in, of the daily, life-time exposure of human populations to a possible hazard that is not

likely to cause harm to the person.

Route of Exposure: The way a chemical can get into a person's body. There are three exposure routes:

- breathing (also called inhalation),
- eating or drinking (also called ingestion), and
- or getting something on the skin (also called dermal contact).

Safety Factor: Also called **Uncertainty Factor**. When scientists don't have enough information to decide if an exposure will cause harm to people, they use "safety factors" and formulas in place of the information that is not known. These factors and formulas can help determine the amount of a chemical that is not likely to cause harm to people.

Source

(of Contamination): The place where a chemical comes from, such as a landfill, pond, creek, incinerator, tank, or drum. Contaminant source is the first part of an **Exposure Pathway**.

Special

Populations:

People who may be more sensitive to chemical exposures because of certain factors such as age, a disease they already have, occupation, sex, or certain behaviors (like cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Statistics:

A branch of the math process of collecting, looking at, and summarizing data or information.

Subclinical:

The presence of a disease without apparent symptoms in the individual. May be an undiagnosed or early stage of a disease, or result in impaired development or reduced potential. Effects may only be apparent after scientific comparisons of many children.

Superfund Site:

See NPL.

Toxic:

Harmful. Any substance or chemical can be toxic at a certain dose (amount). The dose is what determines the potential harm of a chemical and whether it would cause someone to get sick.

Toxicology:

The study of the harmful effects of chemicals on humans or animals.

Uncertainty

Factor:

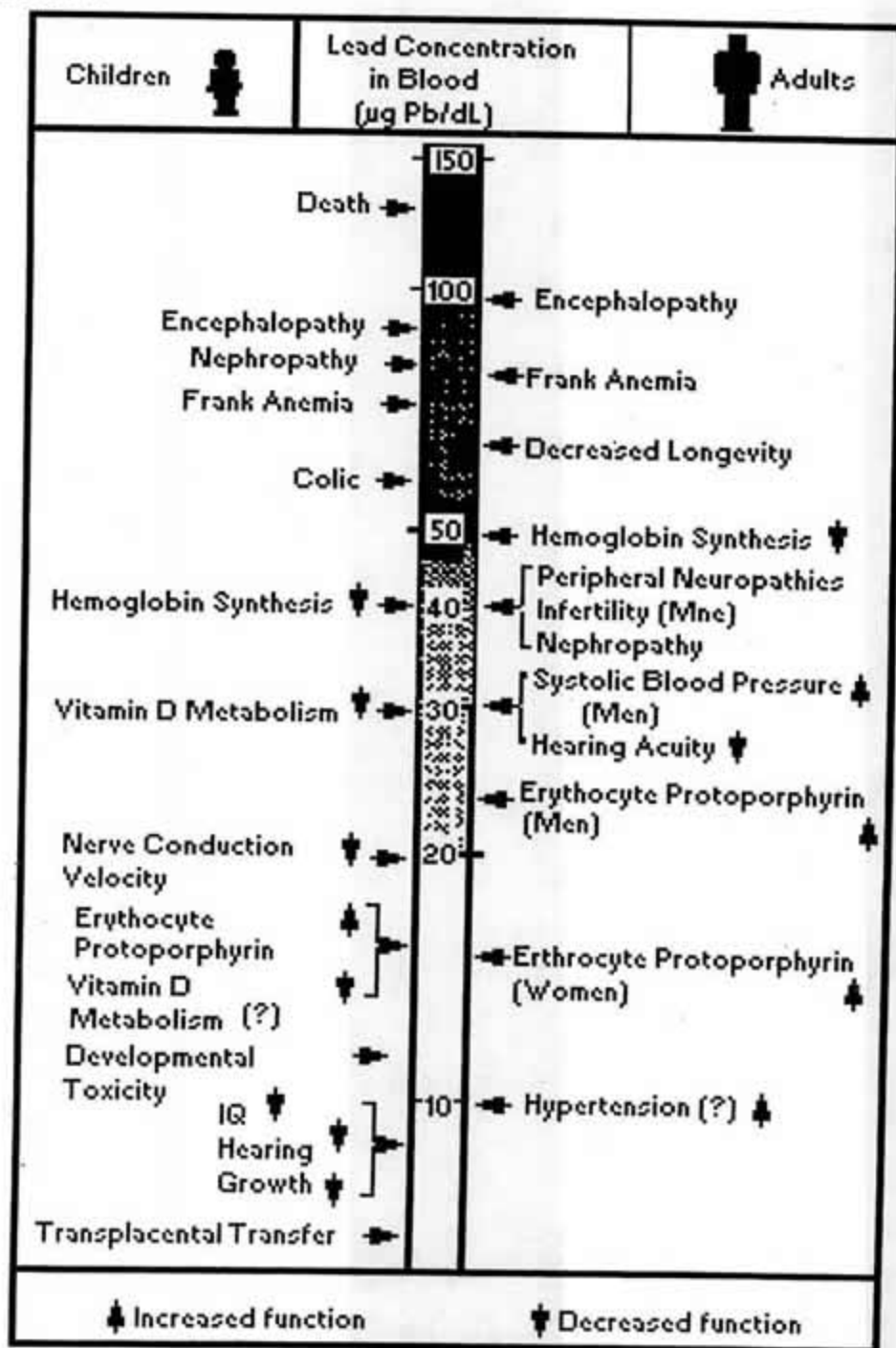
See Safety Factor.

Urgent Public

Health Hazard:

This category is used in ATSDR's Public Health Assessment documents for sites that have certain physical features or evidence of short-term (less than 1 year), site-related chemical exposure that could result in adverse health effects and require quick intervention to stop people from being exposed.

Figure 1. Effects of Inorganic lead in children and adults – lowest observable adverse effect levels



Adapted from ATSDR, Toxicological Profile for Lead (1989)